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### 1993 Feature Article - Change in Base Year of Constant Price National Accounts from 1984-85 to 1989-90

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#### Introduction

This article provides details of work recently completed in the Australian Bureau of Statistics (ABS) to rebase constant price national accounts estimates from average 1984-85 prices to average 1989-90 prices. The information in this article has also been published in an Information Paper (ABS cat. no. 5227.0). The first quarterly national accounts publication to incorporate the rebased estimates will be the December quarter 1992 issue, to be released on 18 March 1993. Data from this publication will be included in the April 1993 issue of Australian Economic Indicators (AEI).

The purpose of this article is to provide some background to the rebase, which commenced in mid 1991, and to indicate those areas of the accounts which will be subjected to the most significant changes as a result of the rebase. The article is supplemented by a second Information Paper (Australian National Accounts : Introduction to Constant Price Estimates at Average 1989-90 Prices ABS cat. no. 5243.0), which was released on 25 February 1993 and contains tables showing constant price estimates on a 1989-90 base consistent with those published in the September quarter 1992 issue of the two quarterly national accounts publications (Australian National Accounts: National Income and Expenditure (cat. no. 5206.0) and Australian National Accounts: Gross Product, Employment and Hours Worked (cat. no. 5222.0)). The Information Paper also describes the major changes in methodology introduced with the rebased estimates. It is available free of charge from the sales locations listed on page iv of AEI.

Constant price estimates on a 1989-90 base will be compiled for all quarters from September quarter 1984 to the latest quarter. (Constant price estimates on a 1984-85 base will be maintained for the period from September quarter 1974 to June quarter 1985.) Long-term quarterly and annual series on a 1989-90 base will be compiled for earlier periods by 'splicing' series calculated using earlier base years. The starting date for the quarterly spliced series of GDP(P) will be September quarter 1974, while that for GDP(I) and GDP(E) will be September quarter 1959.

Now that the two quarterly national accounts publications (Australian National Accounts: National Income and Expenditure (cat. no. 5206.0) and Australian National Accounts: Gross Product, Employment and Hours Worked (cat. no. 5222.0)) have been able to be released simultaneously for several quarters, it has been decided to combine them into a single publication. It will be called Australian National Accounts: National Income, Expenditure and Product and its catalogue number will be 5206.0. The first issue will be in respect of December quarter 1992 and is scheduled for release on 18 March 1993.

As part of the rebase, the range of constant price values on a State/Territory basis (hereafter

referred to simply as 'State') is being extended. In addition to the constant price estimates of private final consumption expenditure, which are currently published on a State basis, constant price State estimates of government final consumption expenditure and private and public gross fixed capital expenditure will also be published each quarter. As a result, the aggregate measure 'State final demand' will be able to be calculated each quarter in constant price terms. These estimates will not be contained in either the Information Paper to be released on 25 February 1993 or in Australian National Accounts: National Income, Expenditure and Product (cat. no. 5206.0). Rather, they will be published in a new quarterly publication - Australian National Accounts: State Accounts (cat. no. 5242.0). The first issue will be for December quarter 1992 and is scheduled for release on 6 May 1993. Future issues are expected to be brought out each quarter within two weeks of the corresponding issue of cat. no. 5206.0. The annual publication (Australian National Accounts: State Accounts (cat. no. 5220.0)) will still be released each year, in April or early May.

## **Background**

Constant price estimates provide a convenient way of measuring 'real' growth in various economic statistics (i.e. the growth after adjusting values to remove the effects of inflation). The ABS commenced publishing annual constant price estimates of expenditure on gross domestic product in 1963 and quarterly estimates in 1970. Since 1963, constant price estimates have been developed for other important economic statistics: gross product by industry, retail sales, agricultural output, building activity and approvals, private new capital expenditure, stocks, manufacturers' sales, overseas trade, and expenditure on research and development.

Over time, several different base years have been used for constant price estimates. For expenditure on gross domestic product, the earliest was 1953-54 and this was followed by 1959-60, 1966-67, 1974-75, 1979-80 and, currently, 1984-85. Other constant price estimates have also been compiled using several base years; generally, though not always, the base years have been the same as those for expenditure on gross domestic product. The current base year for all ABS constant price estimates is 1984-85.

All constant price estimates produced by the ABS are currently being rebased to average 1989-90 prices. During 1993, these estimates will replace those at average 1984-85 prices in relevant ABS publications.

The purpose of this article is to answer some of the questions posed when a new base year is introduced for constant price estimates. For example, why do base years have to be changed and why has a particular year been chosen as the new base year? To answer such questions it is useful to first consider why constant price estimates are produced.

## **Why are constant price estimates needed?**

Many economic statistics, such as gross domestic product, relate to a wide range of goods and services. In order to express all transactions in goods and services as a single aggregate, it is necessary to combine quantities of the component goods and services using a common unit of measurement. The only practicable way in which quantities of diverse goods and services can be aggregated is in terms of money values i.e. dollars. One of the difficulties involved in interpreting the impact of changes in money values from one period to another is that any observed movement is generally a combination of a change in price and a change in quantity. In many cases, there is interest in the changes in the physical quantities underlying the dollar value of transactions with the result that there is a need for value estimates to be adjusted to remove the direct effects of price changes. Such estimates are said to be 'at constant prices' (or in 'real terms').

## **What are constant price estimates and how are they calculated?**

The current price value of a transaction may be thought of as being the product of a price and a quantity. The value of the transaction at constant prices can be derived by substituting, for each current price, the corresponding price in the chosen base year. Total estimates at constant prices for a period are then obtained by summing the constant price value of each component transaction during the period. For example, total quarterly exports of goods at constant prices can be considered to be the sum of the constant price value of each good exported during the quarter.

Conceptually, the preferred way of deriving an estimate of expenditure, or output, at constant prices is to explicitly follow the steps in the definition in the previous paragraph (i.e. for each transaction multiply the quantity of each good or service by the base year price of that good or service to obtain the constant price value and then sum the constant price values of all these transactions). This method is called quantity revaluation. In practice, it is only possible to employ quantity revaluation for a minority of estimates for the following reasons: quantity data are often not available, the goods or services are insufficiently homogeneous, or they are subject to quality changes that are difficult to quantify. Exports of merchandise f.o.b. and agricultural and mining output are the major components for which quantity revaluation is used to compile constant price estimates.

The more common method used to derive estimates at constant prices is to divide the current price values by a price index. This method is called price deflation.

The price indexes used in price deflation comprise a number of price indexes of component goods and services weighted together. If a price index were available for each type of good and service contributing to the current price estimate, and if the weight given to it for each period were proportional to the underlying quantity in the current price estimate, then price deflation would give exactly the same result as quantity revaluation. Price indexes weighted in this way are known as current-weighted (or Paasche) price indexes.

However, price information is generally collected for only a selection of goods and services; furthermore, the information needed to calculate weights is usually only available intermittently. Therefore, fixed-weighted (or Laspeyres) price indexes are generally used in price deflation. Fixed-weighted price indexes are inferior to current-weighted ones for the purpose of calculating constant price estimates, but this deficiency is lessened by revaluing current price values at the most detailed level practicable.

### **Why do base periods have to be changed?**

Constant price estimates attempt to isolate the effects of changes in quantities by removing the effects of price movements from current price values. Conceptually, quantities of different commodities are combined using, as weights, the relative prices in the base period. As a result, estimates on different base years will show different rates of growth if the price relativities in the economy have changed between the base years and if the quantities of the components have changed at different rates (as is usually the case). Even though the underlying quantity data are the same in both cases, these quantities are combined using different weighting patterns (i.e. different price relativities).

The price relativities at a particular time reflect the relative economic worth of goods and services at that time. They are not only influenced by past changes in the economy but they also influence future changes. They are signals that play an integral part in the evolution of the economy. It therefore follows that, if one is concerned with the short-term movements in constant price estimates, then it is desirable that the price relativities in the base year (which are used in weighting together the constant price estimates for all periods in the series) are as close as possible to those for the period concerned, particularly at the end of the series. This is the

principal reason why the ABS rebases its constant price estimates at fairly frequent intervals. Another reason arises from the need to accurately estimate quality and specification changes and to give proper weight to new goods (such as compact disc players and video cameras in recent times). A rebase also provides an ideal opportunity to introduce enhanced methods and more appropriate data sources.

### **Why change the base year now?**

There are several criteria for selecting a base year; unfortunately, they are not always compatible. The criteria are:

- (a) the base year should be as recent as possible;
- (b) 'normal' prices and price relationships should prevail in the chosen base year; and
- (c) if possible, the base year should comply with the international recommendations (by the United Nations Statistical Office) that base years be those ending in zero and five (e.g. 1975, 1980, 1985).

Ideally, a 'normal' year would be chosen as the base year, but, even if such years exist, they would be difficult to identify until several years had elapsed. Precedence is given to the other criteria, namely that the base year should be reasonably recent and coincide with international recommendations. The frequency with which the base year should be changed depends on an assessment of the benefits of frequent rebasing, which is largely determined by the pace of changing price relativities, and the costs of rebasing. Most developed countries have chosen to rebase their constant price estimates either every 5 or 10 years. The ABS has chosen to rebase its estimates every 5 years. For these reasons 1989-90 has been chosen as the new base year.

### **What are the effects of rebasing constant price estimates?**

There are three factors contributing to changes in the rebased estimates: the rebase itself; changes in methodology; and revisions to the weights underlying fixed-weighted price deflators.

#### **Rebase effects**

The most obvious effect is that the level of the rebased constant price estimates is a lot higher than that of the earlier base year estimates for most series. The reason is that inflation has led to prices being higher in the later base year for most goods and services. A notable exception has been computers, for which prices fell significantly between 1984-85 and 1989-90 (see paras 30 and 31 below). Fuel prices were also lower in 1989-90 than in 1984-85.

As mentioned earlier, constant price estimates of a series calculated using different base years generally have different movements. Often the differences are not very great, but in some cases they can be substantial, particularly if a change in methodology has been adopted in conjunction with the introduction of the rebased estimates. In some cases the differences in movement appear to be random, while in others they appear to be systematic and result in significantly different longterm growth rates. An example of the latter that has occurred at every previous rebase is a lowering of the growth rate of private final consumption expenditure. The reason is that there is a substitution effect in which some goods and services experiencing relatively low price increases also tend to experience relatively high quantity increases and hence are accorded a lesser weight in the constant price estimates with a later base year than those with an earlier base year.

Derived series such as implicit price deflators will be quite different on the new base year. The implicit price deflators will all have a value of 100.0 in 1989-90 instead of in 1984-85. Their

movements will also be different, but to a much lesser extent than their levels. Such differences will correspond (inversely) to the differences between the movements of the old and new base year constant price estimates used to derive the implicit price deflators.

The terms of trade are a measure of export prices relative to import prices. They are calculated by the ABS as the ratio of the implicit price deflator for exports of goods and services to the implicit price deflator for imports of goods and services. Consequently, this series will have a value of 100.0 in 1989-90 instead of in 1984-85. There will also be changes in the movements in the terms of trade because of the differences in the movements of the implicit price deflators for exports and imports.

Adjusting gross domestic product (GDP) at constant prices for the terms of trade effect provides a better measure of the change in the real purchasing power of the income generated by domestic production than does the unadjusted estimate. (In future, in accordance with the recommendations in the draft revised issue of the United Nations' A System of National Accounts (SNA), this adjusted measure will be referred to as Real gross domestic income.) The adjustment to GDP for the terms of trade effect will be zero in 1989-90, and so the relationship between constant price GDP and real gross domestic income - both at average 1989-90 prices - will be different from that currently observed using estimates at average 1984-85 prices.

### **Changes in methodology**

Numerous changes in methodology are to be introduced with the rebased estimates. They include the compilation of constant price estimates for the whole of domestic final demand on a State basis, greater use of price deflation for imports of goods (rather than quantity revaluation), and the use of alternative data sources for calculating constant price gross product for the Construction industry. These changes will result in revisions to the growth rates for all the series concerned.

### **Revisions to the weights of fixed-weighted price indexes**

When constant price estimates are rebased, the weights used in many of the fixed-weighted price indexes are replaced (usually for just the later part of the series) by weights that most closely pertain to the new base year. Thus, the movements of the new fixed-weighted price indexes usually differ from those of the old fixed-weighted price indexes. Consequently, the movements of the old and the rebased constant price estimates differ. The size of the differences is determined by a combination of the difference between the new weights and the old ones and the extent to which the growth rates of the component price indexes differ from each other.

### **Will the ABS continue to provide long, continuous series of constant price estimates of expenditure on gross domestic product?**

For some applications, such as econometric modelling, there is a demand for long continuous time series at constant prices. In an attempt to meet this demand, in 1987 the ABS began to publish estimates at average 1979-80 prices for the years 1948-49 through to 1968-69 and for the quarters from September quarter 1959 through to June quarter 1969. These estimates were derived by successively 'splicing' estimates relating to earlier base years. With the introduction in 1988 of constant price estimates at average 1984-85 prices, estimates relating to earlier base years were similarly spliced to provide long, continuous series at average 1984-85 prices.

It is also intended to publish spliced estimates at average 1989-90 prices, but a decision has yet to be made as to the method of splicing to be used. There are several alternatives, each with advantages and disadvantages. The implications of these are currently being examined.

### **Computer equipment and the change in base year**

During the last rebase of constant price estimates (to average 1984-85 prices) the ABS introduced a new price deflator to revalue imports, exports and production of, and final expenditures on, computer equipment. (For details of the development of this deflator by the USA Bureau of Economic Analysis and the reasons for its use in the Australian national accounts, see the ABS publication article: Change in Base Year of Constant Price Estimates from 1979-80 to 1984-85 (cat. no. 5227.0), released on 6 June 1988). Unlike most price indexes, which tend to rise over time, there has been a significant fall in this price index for computers, even after adjustment for exchange rate changes between the Australian dollar and the US dollar. This means that the weight given to computers in constant price estimates will be less in the 1989-90 base year estimates than in the 1984-84 base year estimates. Hence, those constant price estimates in which computers are growing at an above-average rate - which is the general case - will have a lower growth rate at average 1989-90 prices than at average 1984-85 prices, everything else being equal. As a result, the rebase will have a marked effect on the medium-term movements in those aggregates of the accounts which have computers as a significant component. Imports and private gross fixed capital expenditure on equipment will be most affected, while there will be a smaller impact on public gross fixed capital expenditure, private final consumption expenditure and exports. There will be little impact on the movements in constant price expenditure on gross domestic product because the effects on imports will be largely offset by those in the exports and final expenditures components.

Some indications of the magnitude of the above impacts are available at the time of going to press. An example is the total rebase effect on imports of goods, which is one of the aggregates most affected. On a 1984-85 base, imports of goods at constant prices have risen by just over 46 per cent between 1984-85 and 1991-92. The equivalent increase between these two years on a 1989-90 base is 35 per cent. The growth rate in private gross fixed capital expenditure on equipment has also been significantly reduced by the rebase.

It should be noted that the rebase will not have any effect on estimates expressed in current price terms (apart from small revisions to the stock valuation adjustment, consumption of fixed capital and capital stock estimates). It will have no effect on current price estimates such as exports and imports of goods and the balance of payments current account deficit.

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